



Standard Terminology Relating to Plastics¹

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This standard has been approved for use by agencies of the Department of Defense.

1. Scope *

1.1 This terminology covers definitions of technical terms used in the plastics industry. Terms that are generally understood or adequately defined in other readily available sources are not included.

1.2 When a term is used in an ASTM document for which Committee D20 is responsible it is included only when judged, after review, by Subcommittee D20.92 to be a generally usable term.

1.3 Definitions that are identical to those published by another standards body are identified with the abbreviation of the name of the organization; for example, IUPAC is the International Union of Pure and Applied Chemistry.

1.4 A definition is a single sentence with additional information included in discussion notes. It is reviewed every 5 years; the year of last review is appended.

1.5 For literature related to plastics terminology, see Appendix X1.

2. Referenced Documents

2.1 ASTM Standards:

C 162 Terminology of Glass and Glass Products²

D 638 Test Method for Tensile Properties of Plastics³

D 747 Test Method for Apparent Bending Modulus of Plastics by Means of a Cantilever Beam³

D 790 Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials³

D 882 Test Methods for Tensile Properties of Thin Plastic Sheeting³

D 907 Terminology of Adhesives⁴

D 1003 Test Method for Haze and Luminous Transmittance of Transparent Plastics³

D 1566 Terminology Relating to Rubber⁵

D 1928 Practice for Preparation of Compression-Molded Polyethylene Test Sheets and Test Specimens³

¹ This terminology is under the jurisdiction of ASTM Committee D20 on Plastics and is the direct responsibility of Subcommittee D20.92 on Terminology.

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² Annual Book of ASTM Standards, Vol 15.02.

³ Annual Book of ASTM Standards, Vol 08.01.

⁴ Annual Book of ASTM Standards, Vol 15.06.

⁵ Annual Book of ASTM Standards, Vol 09.01.

E 308 Practice for Computing the Colors of Objects by Using the CIE System⁶

3. Terminology

3.1 Definitions:

A-stage, *n*—an early stage in the preparation of certain thermosetting resins in which the material is still soluble in certain liquids, and may be liquid or capable of becoming liquid upon heating.

DISCUSSION—Sometimes referred to as Resol. (See also **B-stage** and **C-stage**.) (1978)⁷

acetal plastics, *n*—plastics based on polymers having a predominance of acetal linkages in the main chain. (See also **polyoxymethylene**.) (1985)

acrylic plastics—plastics based on polymers made with acrylic acid or a structural derivative of acrylic acid. (1982)

addition polymerization—polymerization in which monomers are linked together without the splitting off of water or other simple molecules. (1983)

adiabatic extrusion—a method of extrusion in which, after the extrusion apparatus has been heated sufficiently by conventional means to plastify the material, the extrusion process can be continued with the sole source of heat being the conversion of the drive energy, through viscous resistance of the plastic mass in the extruder. (1978)

aging, *n*—(1) the effect on materials of exposure to an environment for an interval of time. (2) the process of exposing materials to an environment for an interval of time. (1973)

alkyd plastics—plastics based on alkyd resins. (1980)

alkyd resin—a polyester convertible into a crosslinked form; requiring a reactant of functionality higher than two, or having double bonds. (1982)

alloy, *n* (in plastics)—two or more immiscible polymers united, usually by another component, to form a plastic resin having enhanced performance properties.

allyl plastics—plastics based on allyl resins. (1978)

allyl resin—a resin made by polymerization of chemical compounds containing the allyl group. (1978)

amino plastics, *n*—plastics based on amino-resins. (1978)

⁶ Annual Book of ASTM Standards, Vol 06.01.

⁷ Date indicates year of introduction or latest review or revision.

*A Summary of Changes section appears at the end of this standard.

branched polyethylene plastics, *q. v.*, having a standard density of 0.926 to 0.940 g/cm³.

DISCUSSION—These plastics are usually produced commercially by processes employing free radical polymerization. Standard density refers to the density of the material molded to a thickness of 1.9 mm (0.075 in.) using the procedures of Method C in Practice D 1928.

melamine plastics, *n*—plastics based on resins made by the condensation of melamine and aldehydes. (1985)

melt pressure, *n*—the pressure applied to the plastic material in front of the screw driving the injection molding process on a reciprocating screw machine that is calculated based on the hydraulic force acting axially on the screw.

DISCUSSION—Melt pressure is calculated as follows:

$$P = \frac{4 \times 10^{-3} \times F_s}{\pi \times D^2}$$

where:

P = melt pressure, MPa,

F_s = hydraulic axial force, kN, and

D = screw diameter, mm. (1995)

melt temperature, *n*—the temperature of the molten plastic. (1995)

mold open time, *n*—the time interval from the instant the mold begins to open until it is closed again. (1995)

mold temperature, *n*—the mean temperature of the mold cavity surface measured after the system has obtained thermal equilibrium and immediately after opening the mold. (1995)

molding, bag—See **bag molding**. (1985)

molding, blow—See **blow molding**. (1985)

molding, compression—See **compression molding**. (1985)

molding, contact pressure, *n*—See **contact pressure molding**. (1985)

molding, high-pressure, *n*—See **high-pressure molding**. (1985)

molding, injection—See **injection molding**. (1985)

molding, low-pressure, *n*—See **low-pressure molding**. (1985)

molding, transfer—See **transfer molding**. (1985)

molding pressure, compression—the calculated fluid pressure applied to the material in the mold. (1985)

molding pressure, injection—the pressure applied to the cross-sectional area of the material cylinder. (1982)

molding pressure, transfer—the pressure applied to the cross-sectional area of the material pot or cylinder. (1982)

monomer, *n*—a low-molecular-weight substance consisting of molecules capable of reacting with like or unlike molecules to form a polymer. (1983)

necking, *n*—the localized reduction in cross-section which may occur in a material under tensile stress. (1982)

nonrigid plastic, *n*—for purposes of general classification, a plastic that has a modulus of elasticity either in flexure or in tension of not over 70 MPa (10 000 psi) at 23°C and 50 % relative humidity when tested in accordance with Test Methods D 790, Test Method D 747, Test Method D 638, or Test Methods D 882. (1983)

novolac (or novolak), *n*—a phenolic-aldehyde resin which, unless a source of methylene groups is added, remains

permanently thermoplastic. (See also **resinoid** and **thermoplastic**.) (1977)

nylon plastics, *n*—plastics based on resins composed principally of a long-chain synthetic polymeric amide which has recurring amide groups as an integral part of the main polymer chain. (1985)

olefin plastics—plastics based on polymers made by the polymerization of olefins or copolymerization of olefins with other monomers, the olefins being at least 50 mass %. (1983)

oligomer, *n*—a substance composed of only a few nonomeric units repetitively linked to each other, such as a dimer, trimer, tetramer, etc., or their mixtures.

DISCUSSION—The physical properties of an oligomer vary with the addition or removal of one or a few constitutional units from its molecules. (1983)

oligomerization, *n*—the process of converting a monomer or mixture of monomers into an oligomer. (1983)

open-cell cellular plastic, *n*—a cellular plastic in which there is a predominance of interconnected cells. (1985)

organosol, *n*—a suspension of a finely divided polymer in a plasticizer, together with a volatile organic liquid.

DISCUSSION—The volatile liquid evaporates at elevated temperatures, and the resulting residue is a homogeneous polymeric mass, provided the temperature is high enough to accomplish mutual solution of the polymer and plasticizer. (1985)

oxidatively degradable plastic, *n*—See **degradable plastic**.

parallel laminate—a laminate in which all the layers of material are oriented approximately parallel with respect to the grain or strongest direction in tension. (See also **cross laminate**) (1985)

parison, *n*—the shaped plastic mass, generally in the form of a tube, used in blow molding. (ISO) (1983)

phenolic plastics, *n*—plastics based on resins made by the condensation of phenols, such as phenol or cresol, with aldehydes. (1985)

phenolic resin compound, single-stage—a phenolic material in which the resin, because of its reactive groups, is capable of further polymerization by application of heat. (See also **phenolic resin compound, two-stage**). (1978)

phenolic resin compound, two-stage—a phenolic material in which the resin is essentially not reactive at normal storage temperatures, but contains a reactive additive which causes further polymerization upon the application of heat. (1978)

photodegradable plastic, *n*—See **degradable plastic**.

pimple, *n*—an imperfection, a small, protuberance of varied shape on the surface of a plastic product. (1983)

pit, *n*—an imperfection, a small crater in the surface of the plastic, with its width of approximately the same order of magnitude as its depth. (1983)

plastic(s), *n*—a material that contains as an essential ingredient one or more organic polymeric substances of large molecular weight, is solid in its finished state, and, at some stage in its manufacture or processing into finished articles, can be shaped by flow.

DISCUSSION—Rubber, textiles, adhesives, and paint, which may in some cases meet this definition, are not considered plastics. See ASTM definitions of these terms.

Discussion—The above definition may be used as a separate meaning from the definitions contained in the dictionary for the adjective "plastic."

Discussion—The plural form may be used as an adjective to refer to two or more plastic materials, for example, plastics industry. However, when the intent is to distinguish "plastic products" from "wood products" or "glass products," the singular form should be used. As a general rule, if the adjective is to restrict the noun modified with respect to the type of material, "plastic" should be used; if the adjective is to indicate that more than one type of plastic material is or may be involved, "plastics" is permissible. (1982)

plastic foam, n—See **cellular plastic** (the preferred terminology). (1983)

plasticizer, n—a substance incorporated in a material to increase its workability, flexibility, or distensibility. (1983)

plastic pipe—a hollow cylinder of a plastic material in which the wall thicknesses are usually small when compared to the diameter and in which the inside and outside walls are essentially concentric. (1982)

plastic tubing, n—(1) a particular size of plastic pipe in which the outside diameter is essentially the same as the corresponding size of copper tubing.

(2) small diameter flexible pipe. (See **plastic pipe**.) (1982)

plastisol, n—a liquid suspension of a finely divided PVC polymer or copolymer in a plasticizer.

Discussion—The polymer does not dissolve appreciably in the plasticizer at room temperature, but does at elevated temperatures, to form a homogeneous plastic mass (plasticized polymer). (1985)

plate-mark—any imperfection in a pressed plastic sheet resulting from the surface of the pressing plate. (1982)

polepiece, n—in reinforced plastics, the supporting part of the mandrel used in filament winding, usually on one of the axes of rotation. (1985)

polyaddition—See **addition polymerization**. (1982)

polyamide plastics—See **nylon plastics**. (1982)

polyarylate, n—See **aromatic polyester**. (1986)

polyaryletherketone, n—a polymer in which aryl groups are connected by one or more ether as well as one or more Ketone linkages. (1991)

polybutylene, n—a polymer prepared by the polymerization of butene as the sole monomer. (See **polybutylene plastics** and **butylene plastics**.) (1985)

polybutylene plastics, n—plastics based on polymers made with butene as essentially the sole monomer. (1985)

polycarbonate, n—a polyester polymer in which the repeating structural unit in the chain is of the carbonate type. (1983)

polycarbonate plastics—polyester plastics based on polymers in which the repeating structural units in the chains are essentially all of the carbonate type. (1983)

polycondensation—See **condensation polymerization**. (1982)

polydicyclopentadiene plastic, n—a crosslinked thermoset polymer formed by the ring-opening metathesis polymerization of dicyclopentadiene.

polyester, n—a polymer in which the repeated structural unit in the chain is of the ester type. (ISO)

Discussion—The polyester is linear and thermoplastic if derived, either actually or formally, from (a) mono-hydroxy-mono-carboxylic acids by self-esterification, or (b) the interaction of diols and dicarboxylic acids. (1985)

polyester plastics—synonymous with **alkyd plastics**.

polyether, n—a polymer in which the repeated structural unit in the chain is of the ether type. (1985)

* **polyethylene, n**—a polymer prepared by the polymerization of ethylene as the sole monomer. (See **polyethylene plastics** and **ethylene plastics**.) (1982)

* **polyethylene plastics**—plastics based on polymers made with ethylene as essentially the sole monomer.

Discussion—In common usage for this plastic, essentially means no less than 85 percent ethylene and no less than 95 percent total olefins. (1975)

* **polymer, n**—a substance consisting of molecules characterized by the repetition (neglecting ends, branch junctions and other minor irregularities) of one or more types of monomeric units. (IUPAC) (1971)

polymerization—a chemical reaction in which the molecules of monomers are linked together to form polymers. (See also **polycondensation** and **polyaddition**.) (1971)

polymethylmethacrylimide (PMMI), n—a thermoplastic polymer formed from a reaction of poly(methyl methacrylate) and monomethyl amine. (1992)

polyol, n—an alcohol having many hydroxyl groups, also known as a polyhydric alcohol or polyalcohol.

Discussion—In cellular plastics usage, the term includes compounds containing alcoholic hydroxyl groups such as polyethers, glycols, polyesters, and castor oil used in urethane foams. (1983)

polyolefin, n—a polymer prepared by the polymerization of an olefin(s) as the sole monomer(s). (See **polyolefin plastics** and **olefin plastics**.) (1982)

polyolefin plastics, n—plastics based on polymers made with an olefin(s) as essentially the sole monomer(s). (1985)

polyoxymethylene, n—a polymer in which the repeated structural unit in the chain is oxymethylene.

Discussion—Polyoxymethylene is theoretically the simplest member of the generic class of polyacetals. (ISO) (1983)

polyoxymethylene plastics, n—acetal plastics based on polymers in which oxymethylene is essentially the sole repeated structural unit in the chains. (ISO) (See also **acetal plastics**.) (1985)

polyphthalamide (PPA), n—a polyamide in which residues of terephthalic acid or isophthalic acid or a combination of the two comprise at least 60 molar percentage of the dicarboxylic acid part of the repeating structural units in the polymer chain. (1992)

polypropylene, n—a polymer prepared by the polymerization of propylene as the sole monomer. (See **polypropylene plastics** and **propylene plastics**.) (1978)

polypropylene plastics—plastics based on polymers made with propylene as essentially the sole monomer. (1975)

polystyrene, n—a polymer prepared by the polymerization of styrene as the sole monomer. (See **styrene plastics**.) (1978)

polyterephthalate, n—a thermoplastic polyester in which the terephthalate group is one of the repeating structural unit in the polymer chain. (1985)

polyterephthalate plastics—a thermoplastic polyester in which the terephthalate group is a repeated structural unit in the chain, the terephthalate being in greater amount than other

dicarboxylates which may be present. (1985)

polyurethane, *n*—a polymer prepared by the reaction of an organic diisocyanate with compounds containing hydroxyl groups.

DISCUSSION—Polyurethanes or urethanes, as they are sometimes called, may be thermosetting, thermoplastic, rigid or soft and flexible, cellular, or solid. (1983)

poly(vinyl acetate), *n*—a polymer prepared by the polymerization of vinyl acetate as the sole monomer. (1985)

poly(vinyl alcohol)—polymers prepared by the essentially complete hydrolysis of polyvinyl esters. (1978)

poly(vinyl chloride)—a polymer prepared by the polymerization of vinyl chloride as the sole monomer (vinyl chloride content in monomer not less than 99 %). (2000)

postforming, *n*—the forming of cured or partially cured thermosetting plastics. (1982)

pot life—the period of time during which a reacting thermosetting composition remains suitable for its intended processing after mixing with reaction-initiating agents. (1973)

powder blend—See **dry-blend**. (1982)

preform, *n*—a coherent, shaped mass of powdered, granular or fibrous plastic molding compound, or of fibrous filler material with or without resin. (ISO) (1982)

premix, *n*—in reinforced thermosetting plastics, the admixture of resin, reinforcements, fillers, etc., not in web or filamentous form, ready for molding. (1982)

prepolymer, *n*—a polymer of degree of polymerization between that of the monomer or monomers and the final polymer. (ISO) (1982)

prepreg, *n*—in reinforced thermosetting plastics, the admixture of resin, reinforcements, fillers, etc., in web or filamentous form, ready for molding. (1982)

pressure-break, *n*—as applied to a defect in a laminated plastic a break apparent in one or more outer sheets of the paper, fabric, or other base visible through the surface layer of resin which covers it. (1982)

propylene plastics, *n*—plastics based on polymers of propylene or copolymers of propylene with other monomers, the propylene being in the greatest amount by mass. (ISO) (1982)

pulled-surface, *n*—as applied to a defect in a laminated plastic imperfections in the surface ranging from a slight breaking or lifting in spots to pronounced separation of its surface from its body. (1982)

recycled plastic, *n*—those plastics composed of post-consumer material or recovered material only, or both, that may or may not have been subject to additional processing steps of the types used to make products such as recycled-regrind or reprocessed or reconstituted plastics. (1991)

regular transmittance—ratio of the light flux transmitted without diffusion to the flux incident. (1985)

reinforced plastic—a plastic with high strength fillers imbedded in the composition, resulting in some mechanical properties superior to those of the base resin. (See also **filler**.)

DISCUSSION—The reinforcing fillers are usually fibers, fabrics, or mats made of fibers. (1973)

reinforced reaction injection molding (RRIM), *n*—the pro-

cess of using solid reinforcements, such as, glass fiber, mica, or talc in the reaction injection molding process. (1983)

release agent, *n*—a material added to a compound or applied to the mold cavity, or both, to reduce parts sticking to the mold. (1983)

reprocessed plastic—a thermoplastic prepared from usually melt processed scrap or reject parts by a plastics processor, or from non-standard or non-uniform virgin material.

DISCUSSION—Use of the term “scrap” in this definition does not connote that the feed stock is necessarily less desirable or useable than the virgin material from which it may have been generated. Reprocessed plastic may or may not be reformulated by the addition of fillers, plasticizers, stabilizers, pigments, etc. See **reworked plastic** and **recycled plastic**. (1985)

resin, *n*—a solid or pseudosolid organic material often of high molecular weight, which exhibits a tendency to flow when subjected to stress, usually has a softening or melting range, and usually fractures conchoidally.

DISCUSSION—In a broad sense, the term is used to designate any polymer that is a basic material for plastics. (1982)

resin streak, *n*—a streak of excess resin on the surface of a laminated plastic. (1982)

reworked plastic, *n*—a plastic from a processor's own production that has been reground, pelletized, or solvated after having been previously processed by molding, extrusion, etc. See **recycled plastic** and **reprocessed plastic**. (1991)

rigid plastic, *n*—for purposes of general classification, a plastic that has a modulus of elasticity, either in flexure or in tension, greater than 700 MPa (100 000 psi) at 23°C and 50 % relative humidity when tested in accordance with Test Method D 747, Test Methods D 790, Test Method D 638, or Test Methods D 882. (1983)

rise time, *n*—the time required for a free-rise cellular plastic to achieve its ultimate expansion under controlled conditions. (1983)

rubber, *n*—term not defined by Committee D20. Definition approved by Committee D11 on Rubber and Rubber-Like Materials is as follows:

“**rubber**—a material that is capable of recovering from large deformations quickly and forcibly, and can be, or already is, modified to a state in which it is essentially insoluble (but can swell) in boiling solvent, such as benzene, methylethylketone, and ethanol-toluene azeotrope.”

“A rubber in its modified state, free of diluents, retracts within 1 min to less than 1.5 times its original length after being stretched at room temperature (18 to 29°C) to twice its length and held for 1 min before release.”

DISCUSSION—See Terminology D 1566.

runner, *n*—(1) the secondary feed channel in an injection or transfer mold that runs from the inner end of the sprue or pot to the cavity gate.

(2) the piece formed in a secondary feed channel or runner. (1986)

sample, *n*—a small part or portion of a material or product intended to be representative of the whole. (1972)

saran plastics—See **vinylidene chloride plastics**. (1972)

semirigid plastic, *n*—for purposes of general classification, a